Using the Program Evaluation Tool (PET) to Value the Environmental, Economic and Social Impacts of Emission Reduction Programs

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Abstract:

This report outlines how the triple bottom line assessment methodology utilized by the Program Evaluation Tool (PET) can capture the added co-benefits of implementing programs meant to achieve the sustainable action plan goals of local governments, in the form of economic, environmental and community outcomes including: emission reductions, job creation and economic multiplier affects.

Keywords: Sustainable Return on Investment (SROI), Cost Benefit Analysis, Program Evaluation, Emission Reduction Strategies, Triple Bottom Line, Input Output Analysis.

Waste Less and Achieve More - with the Program Evaluation Tool

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About the Program Evaluation Tool (PET)

The Program Evaluation Tool allows governments to prioritize their investment in programs based on their sustainable outcomes, and determine the most productive use of valuable resources. It can be used to evaluate individual programs or a portfolio of options collected through a strategic plan, Request for Information or Proposal or idea challenge.

Using a triple bottom line framework the PET streamlines program evaluation and outcome measurement by automating data collection and data analysis and outputting a final dashboard of key metrics material to the advancement of climate action plan goals. These results can be used to inform sustainability officers, city councils, investors and other stakeholders engaged in the public process.

Dashboard Metrics Include:

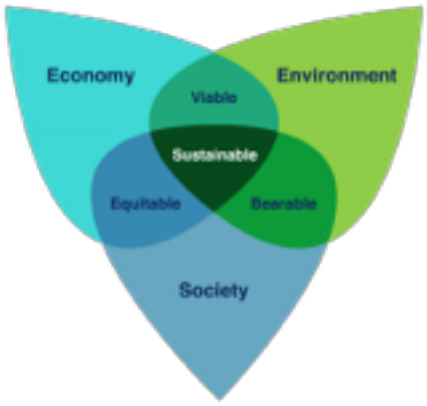
- Traditional Return on Investment (ROI)
- Sustainable Return on Investment (SROI)
- Net Present Value (NPV)
- Full Time Employee (FTE) needs
- Budget Requirements
- Revenue Generation Potential
- Emission Reductions Potential
- Job Creation Potential
- Monetized Value of Human Health Benefits
- Direct, Indirect and Induced Economic Outcomes

The PET is capable of providing a robust analysis and comparison of the the sustainable return on investment of a wide range of emission reduction strategies; ranging from renewable energy development programs, zero waste strategies, alternative transportation development, sequestration strategies, carbon offsets and leaves room to incorporate undetermined innovation strategies which may develop in the future.

By using the tool local governments can gain much needed transparency into how to efficiently achieve their commitments to sustainability goals, and improve the quality of life in their communities.

Why use a Triple Bottom Line Framework?

Greenhouse gas (GHG) emissions reduction is the overarching challenge that drives policy and program development in sustainability offices in many cities. With many local governments committing to ambitious sustainability goals that include capturing the emission reductions through zero waste goals, encouraging the switch to alternative modes of transportation, the capture of energy savings from energy efficiency programs, as well as mandated renewable energy portfolio standards, proven strategies are needed to achieve reductions at scale.



The Triple Bottom Line Framework

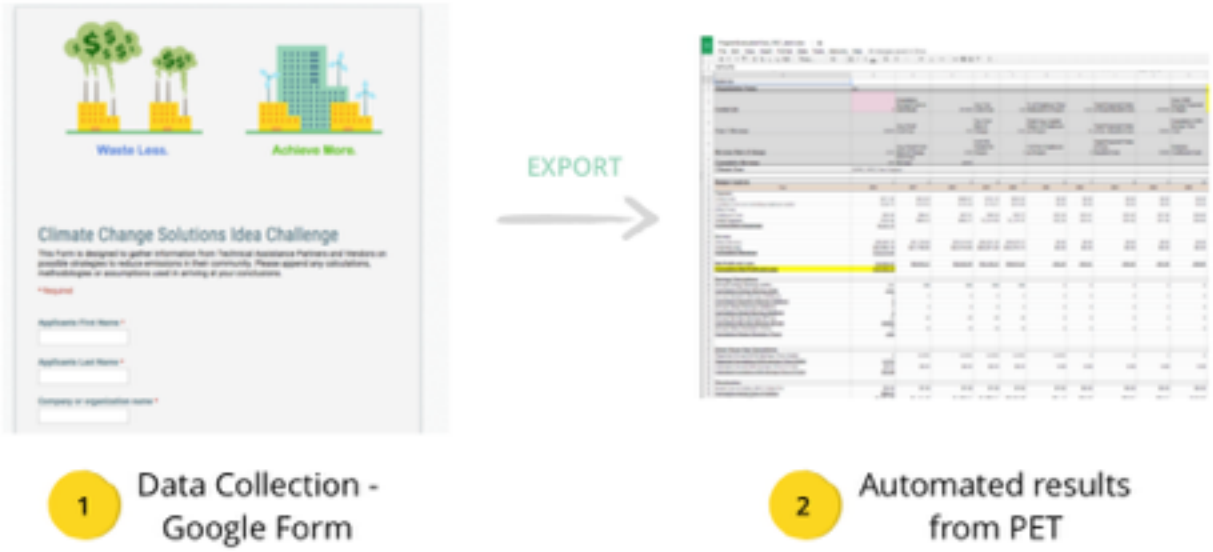
With so many good options for building a resilient future on the table it can be difficult to choose where to allocate limited city resources. As a result, local governments are looking for ways to manage their portfolio's of sustainable solutions, procure green financing, and ultimately implement programs that yield long term environmental, economic, and social returns.

Currently, traditional program evaluation only captures the direct benefits of the programs in the form of financial returns on investment. By expanding on the valuations provided by traditional program evaluations by utilizing a methodology that captures the total benefit of emission reduction programs, through a triple bottom line assessment structure, local governments will be able to translate their program's outcomes into tangible impacts that not only improve the bottom line, but yield environmental and community benefits. These metrics can then be used to help procure funding for their programs, inform decisions about which programs to finance, and communicate sustainable progress in accessible and relevant terms.

Using the Program Evaluation Tool:

Evaluation of the triple bottom line impacts of of various programs and projects is facilitated in three stages by the program evaluation toolkit.

i. Data Collection
ii. Data Import
iii. Evaluation Through the Program Evaluation Tool



Data Collection

Data collection is traditionally the most time consuming process of program evaluation. To aid the process our team has created a scaleable solution in the form of a data collection survey. The survey is designed to gather the essential information needed about emission reduction strategies to then calculate sustainable programmatic outcomes.

The data collection form is given to technical assistance partners and vendors in the local community who are working to implement emission reduction strategies through several different industries.

Throughout the form response process respondents are given opportunities to describe, report, and provide assessment methodologies for their programs including 1. Respondent identification. 2. Filter questions designed to streamline the user experience. 3. Additionally assessment. 4. Revenue analysis. 5. Budget analysis. 6. Employee needs. 7. Environmental, economic and social externalities. 8. Potential greenhouse gas savings. and 9. Project specific information.

There are two links for accessing the Data Collection form.

1. Share this link with your respondents.
2. Keep this link internal, it provides backend access to the full survey as well as access to responses.

Inputs of the Response Form include:

1. Identification Questions: Who is the respondent and what is their contact info?
First Name
Last Name

Organization Name
Organizational Type (section)
Organization Website
Email
Phone Number
Willing to Collaborate with other applicants (selection)
Featured on Online
Portal
Project Description
Useful Life of Project
Regional Grid selection (map/Dropdown)

2. Filter Questions: ***Have the following been evaluated?*** **Questions meant to streamline the response experience and gather only the data that has been analyzed by the respondent.**
GHG assessment
Legal or policy mandated fulfillment
Budget
Employee needs
Revenue
Project Category

3. Additionality Assessment Questions: is the project already required by mandate or policy?
Other potential outcomes beyond policy mandate
Describe other outcomes

4. Revenue Questions: ***Does the program generate income?***
Describe revenue
Year one revenue
Cumulative revenue
Revenue fluctuation
Rate of change (if applicable)
Customer cost or savings changes
Methodology

5. Budget Questions: ***What will the project cost?***
Average fixed cost per year (not including employee needs)
Describe fixed costs
Fixed costs fluctuation
rate of change
average variable costs per year
describe variable costs
expected fixed costs fluctuation
rate of change
other expenses not captured by fixed or variable costs

6. Employee Questions: ***Who is employed to implement the program?***
Full time employee (FTE) needs
Percentage of time dedicated to project
total average loaded salary per employee
New job creation
how many new jobs? (if yes)

7. Social Externalities Questions: ***What impacts will the project have on the larger community and society?***
Describe any social benefits/costs of the project
If possible value the social benefits in USD
Methodology of valuation

8. Greenhouse Gas Questions: ***What emissions are avoided or generated by the project?***
Describe Environmental benefits/impacts
Value the projected value of env impacts in USD.
Describe Economic impacts of project
value economic impacts in USD.
Methodology for assessment
what year of the project do emission savings begin
cumulative GHG savings from project
emission coefficient used
methodology

9. Project specific questions: ***Questions designed to collect industry specific information.***
<u>Energy Project Data Collection:</u>
Building Sector
expected annual savings (kWh)
cumulative energy savings (kWh)
Annual Natural Gas Savings (BTU)
Cumulative Natural Gas Savings (BTU)
Grid connection
line loss factor considered (if yes)
Ratio of line loss (if yes)
Other inputs
other externalities

Data Import

When a respondent completes the Data collection survey their answers go into a back end spreadsheet called the "responses sheet" accessible only by those with editor privileges through the internal survey link. This separation is important because respondents to the idea competition will be providing sensitive data including contact info and financial information. Having two pathways into the survey response form also preserves the functionality of the tool by preventing unwanted edits that could disrupt the ability for the data collection form and Program Evaluation Tool to communicate. The responses sheet then needs to be migrated into the PET as a new tab, by:

1. opening both the "responses sheet and the Pet.
2. right clicking the sheet button at the bottom "responses sheet".
3. selecting "move to" and selecting the PET as destination.

This will then trigger the formulas in PET and run the calculation to produce the dashboard of results.

Future versions of the tool will be designed to eliminate the need for manual import from the response sheet to the PET, and host the entire process through a web portal or application. If you have any questions or need data import support contact sam.irvine@presidio.edu.

Data Analysis Through the Program Evaluation Tool

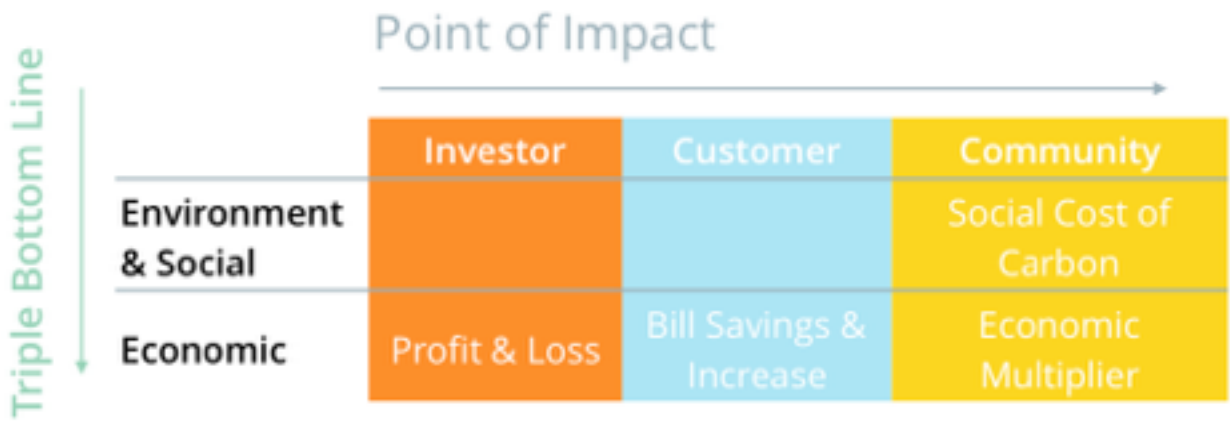
Form responses are then imported into the PET. The data is then automatically skimmed by the PET and categorized into [1]line items including:

- Budget Analysis - Appendix 1.
- Savings Calculations- Appendix 2.
- Greenhouse Gas Calculations- Appendix 3.
- Monetizations- Appendix 4.
- Metrics and Results

Time value of money adjustments:
Where applicable the line items are adjusted for the present value of money, based on an internal hurdle rate provided by the city in which the tool is being used. All data collected by the form is collected in nominal dollars, and the PET adjusts for an inflation rate (provided by the tool's user) to provide all outputs in real dollars.

Metrics and Results:

Once the data has been categorized the PET produces Metrics and Results from the analysis and are posited into a value matrix (see below). In which, direct, indirect, and induced impacts are shown on the horizontal rows. The triple bottom line metrics are shown vertically as columns.



The intersection of these axis of the Result Matrix shows not only what type of impact can be expected, but also where in the stakeholder chain they occur.

[1] Additional descriptions of the evaluation methods for line items can be found in the Appendix

Categorical impacts can also be isolated from Net Total Benefit by summing the results either vertically down the column to produce stakeholder impacts, or horizontally across the row to show environmental, social and economic impacts.

The result matrix is then rolled together through a sum function to show the *Net Total Benefit* of the program; which contains all direct impacts and resulting co-benefits and costs of a program into a single output. This is represented by the model in real dollars (adjusted for inflation and an internal hurdle rate provided by the user)

Net Total Benefit = Environmental Impact + Social Impact + Economic Impact

Or

Net Total Benefit= Investor Impact + Individual Impact + Community Impact

The PET then divides Net Total Benefit by the cost of investment required to run the program. This creates the key ratio of resource productivity for programmatic comparison within the PET and tells the user how much triple bottom line impact each program can create per dollar spent. This value effectively represents the *sustainable return on investment (SROI)* of the program. SROI can be used to cross compare proposed projects to provide insights on how much they give back to the community in terms of the value of GHG reductions, economic stimulus and bill savings.

Sustainable ROI (SROI) = Net Total Benefit / Program Expenses

The PET also uses information collected from the response form to evaluate the annual and cumulative emission reductions of the program as well as the cost per ton of Co2e reductions.

Appendix:

A1: Budget Analysis
The data collected from the response form on the budget needed to run the program is structured into the the below line items. Both Revenue and Expenses are adjusted by the PET to account for inflation and adjust to reflect the disclosed rate of change per year as disclosed in the data collection form.

Expenses: Programatic expenses capture the budget needed to run the program and include the following:

Fixed Costs:
Variable Costs (not including employee needs)
Other Costs
Employee Costs
Total Expenses= sum of expenses each year
Cumulative Expenses= sum of expenses over project life.

Revenue: Programatic activities often result in revenue generation. For example, energy efficiency programs often are accompanied by revenue from the collection of utility bills or renewable energy programs are able to generate cashflow by selling their revenue into the wholesale energy market. The following line items are used to evaluate the revenue generation potential of the project.

Direct Revenue
Total Revenue
Cumulative Revenue
Net Profit and Loss (NPL) = Annual Revenue-Annual Expenses
Cumulative Net Profit and Loss = Sum of NPL over project life.

A2: Savings Calculations
The PET captures the energy, natural gas, fuel use, waste diversion or other savings reported by the respondent in the data collection form and organizations them into the following structure.

Annual Energy Savings (kWh)
Cumulative Energy Savings (kWh
Annual Gasoline Savings (Gallons)
Cumulative Gasoline Savings (Gallons)
Annual Diesel Savings (Gallons)
Cumulative Diesel Savings (Gallons)
Annual Nat Gas Savings (BTUs)

Cumulative Nat Gas Savings (BTUs)
Annual Wate Diversion (Tons)
Cumulative Waste Diversion (Tons)

A3: Green House Gas Calculations

The PET uses the US Energy Information Administration's (EIA)'s most recent emission coefficients, as well as the grid specific climate zone selected by the response form respondent to convert reported savings into their Carbon Dioxide Equivalency (CO2e). In addition the PET compares its internal calculations of emission reductions to those reported by the respondent. The following format is used:

Reported Annual GHG Savings (Tons Co2e)
Reported Cumulative GHG savings (Tons Co2e)
Calculated Annual GHG Savings (Tons fo Co2e)
Calculated Cumulative GHG Savings (Tons of Co2e)

Climate Zones eGRID:

Regional emission factors in the PET use the the EPA's "Emissions & Generation Resource Integrated Database (eGRID), a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States." eGRID's database was last updated in October 2015.

A4: Monetizations

The PET's evaluation of the environmental, social, and economic program outcomes are based off industry best practice for monetizing the positive and negative externalities of program implementation and resulting emission reductions or increases. The following table highlights the outputs material to triple bottom line assessment of energy efficiency programs and their sources.

Job Creation	Efficiently Energising Job Creation in Los Angeles, 2014
Economic Multiplier Effect	Efficiently Energising Job Creation in Los Angeles, 2014
Social Cost of Carbon	U.S EPA

Los Angeles Department of Water and Power Study (LADWP)

A collaborative publication of the UCLA Luskin Center and the LADWP *Efficiently Energizing Job Creation in Los Angeles, "*seeks to estimate the magnitude of job-creation benefits for 18 energy efficiency programs administered by the Los Angeles Department of Water and Power

(LADWP) in 2014. The study finds the job-creation benefits for these programs are large in both absolute and relative terms, especially when compared to other energy sector investments. Not only are these programs local job creators, but they are also benefiting a diverse set of LADWP customers in energy and economic savings."

About the Social Cost of Carbon:
"EPA and other federal agencies use the social cost of carbon (SC-CO2) to estimate the climate benefits of rule makings. The SC-CO2 is an estimate of the economic damages associated with a small increase in carbon dioxide (CO2) emissions, conventionally one metric ton, in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (i.e., the benefit of a CO2 reduction).

Social Cost of CO2, 2015-2050 a (in 2014 Dollars per metric ton CO2)
Source: Technical Support Document (PDF, 21 pp, 1 MB): Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (May 2013, Revised July 2015)

	Discount Rate and Statistic			
Year	**5% Average**	**3% Average**	**2.5% Average**	**3% 95th percentile**
2015	$12	$40	$62	$120
2020	$13	$47	$69	$140
2025	$16	$51	$76	$150
2030	$18	$56	$81	$170
2035	$20	$61	$87	$190
2040	$23	$67	$93	$200
2045	$26	$71	$99	$220
2050	$29	$77	$110	$240

The SC-CO2 is meant to be a comprehensive estimate of climate change damages and includes changes in net agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning. However, given current modeling and data limitations, it does not include all important damages. The IPCC Fifth Assessment report observed that SC-CO2estimates omit various impacts that would likely increase damages. The models used to develop SC-CO2 estimates, known as integrated assessment models, do not currently include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages

and because the science incorporated into these models naturally lags behind the most recent research. Nonetheless, the SC-CO2 is a useful measure to assess the benefits of CO2 reductions.

Limitations of the PET:

Community Impacts Evaluation Limitations:
Job creation data for the PET is based off a LADWP Study of energy efficiency programs in the greater Los Angeles Area. The researcher's methodology uses the IMPLAN model based on data inputs from that region to calculate direct, indirect and induced impacts of the program son job creation. The PET currently uses this data as placeholder data until more regional specific data becomes available. Consequently, outputs of the PET may not be entirely accurate to the bay area region.

Environmental Impact Evaluation Limitations:
The PET currently uses the 5% average value for the social cost of carbon to monetize the costs of pollution on society. This number is the most conservative estimate provided by the EPA. As a result the PET likely underestimates the environmental externalities of emissions reductions on society.

Economic Impact Evaluation Limitations:
Economic multiplier data for the PET is based on results from the LADWP Study is based on energy efficiency programs in the greater Los Angeles Area. The researcher's methodology uses the IMPLAN model based on data inputs from that region to calculate direct, indirect and induced impacts of the programs on regional economic multiplier affects. The PET currently uses this data as placeholder data until more regional specific data becomes available. Consequently, outputs of the PET may not be entirely accurate to the bay area region.

Emissions Calculations Limitations:
Current grid emission factors are based on regional calculations. ICLEI and other organizations are beginning work to create the emission inventories of cities and local governments to compile emission data specific to more local geographies and utility operations. In California community choice aggregation options may also change the grid emission factors of local communities. These values are not currently used by the PET but have the potential to be integrated in future iterations. It is the recommendation of the PET developers that emissions data be updated as utility scale generation shifts over time.